REMARKS

This Amendment is in response to the Office Action mailed December 7, 2001. Claims 1-19 are pending in the application and have been rejected. Applicants respond to the Office Action as follows.

Response to objection to the drawings

The drawings were objected to as failing to comply with 37 CFR § 1.84(b)(5) because they do not include reference sign 100 for detection axis 100 in the specification. Applicants do not understand that detection axis 100 is described in the application. In response to the objection, Applicants have amended the specification to delete reference numeral 110 in the specification on Page 4, line 12. Withdrawal of the objection to the specification is respectfully requested.

Claim 11 was objected to on the basis that it depends upon claim 12. Applicants have amended claim 11 to depend from claim 10. Accordingly, withdrawal of the objection with respect to claim 11 is respectfully requested.

Response to claim rejections - 35 U.S.C. § 102

Claims 1-5, 9, 12, 13, 16, 17 and 19 were rejected under 35 U.S.C. § 102(e) as being anticipated by Perry, U.S. Patent No. 3,688,287. Perry issued August 29, 1972 more than one year prior to the filing date of the present application. Claims 1-5, 9, 12, 13, 16 and 17 have been amended and as amended, Applicants respectfully request reconsideration and allowance of claims 1-5, 9, 12, 13, 16 and 17 over Perry.

Claims 1-5 and 9, as amended, recite *inter alia* a movable head suspension assembly coupled to an actuator and movable thereby and having a head coupled thereto and a transducer supported on the suspension assembly to detect vibration. As amended, claims 1-5 and 9 are not anticipated by Perry. In contrast to Perry, the present invention provides a

transducer on a movable head suspension assembly coupled to an actuator to distinguish head disc contact for a particular head.

Perry does not teach nor suggest a transducer on a movable head suspension assembly coupled to an actuator having a head coupled thereto. In Perry, transducer 12 is secured to a yoke 15 which supports a plurality of heads. Each yoke carries 64 (32 on each side) read write heads 16 adjacent to the faces of the corresponding memory disc. Perry teaches a transducer 12 on a yoke supporting a plurality of heads but does not teach or suggest a suspension mounted transducer coupled to an actuator and moveable thereby. The suspension mounted transducer of the present invention as claimed provides flexibility and advantages over prior devices. Reconsideration and withdrawal of the rejection of claims 1-5 and 9 are respectfully requested.

Method claims 12, 13, 16 and 17 have been amended to recite *inter alia* a transducer on a movable head suspension assembly and the step of moving the movable head suspension assembly to position the head for read write operations and detecting a transducer signal and outputting a level detected signal indicative of head vibration which is not taught nor suggested by Perry. As previously explained, Perry does not teach nor suggest a transducer on a movable suspension assembly and the step of moving the suspension assembly having the transducer thereon for head placement.

Claim 19 is a means-plus-function claim which as amended recites *inter alia* means on a movable head suspension assembly for detecting head vibration. Means-plus-function language in a claim is interpreted to include the corresponding elements disclosed in Applicants' specification and equivalents. Applicants' specification discloses a transducer on a movable suspension arm or portion coupled to an actuator to detect vibration. As previously discussed, Perry does not teach or suggest the corresponding structure disclosed in Applicants'

specification nor equivalents. Furthermore, the Office Action does not establish that the subject matter taught by Perry is equivalent to the subject matter disclosed in Applicants' specification to detect head vibration. Perry teaches a transducer on a non-actuated yoke assembly supporting a plurality of heads which is not equivalent to the corresponding structure disclosed in Applicants' specification.

As set forth in the Supplemental Guidelines of June 2002, equivalency is established where (1) the prior art element performs the identical function specified in the claim in substantially the same way and produces substantially the same results as the corresponding element disclosed in the specification; (2) a person of ordinary skill in the art would have recognized the interchangeability of the elements shown in the prior art for the corresponding element disclosed in the specification; (3) there are insubstantial differences between the prior art element and the corresponding element disclosed in the specification, or (4) the prior art element is a structural equivalent of the corresponding element disclosed in the specification. The Office Action has not established that the subject matter taught by Perry is equivalent to the claimed subject matter based upon the Guidelines discussed above. Accordingly, withdrawal of the rejection of claim 19 is respectfully requested.

Response to claim rejections - 35 U.S.C. § 103

Claim 6 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Perry and further in view of Yeack-Scranton, US Patent No. 4,532,802. Claim 6 is dependent upon amended claim 1 which is not taught nor suggested by the combination of Perry and Yeack-Scranton, Reconsideration and withdrawal of the rejection to claim 6 is respectfully requested.

Claims 7 and 15 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Perry. As previously discussed,

claims 7 and 15 are dependent upon amended claims 1 and 12 which as previously discussed are not anticipated nor suggested by Perry. Furthermore there is no teaching nor suggestion in Perry to execute a recovery algorithm to rewrite data in drive memory based upon a level detected signal from the transducer so that data in the drive memory is not lost or corrupted. As described in Applicants' specification prior readback processes where the drive read backs data to confirm the integrity of the data slows operation. The recited subject matter of claims 7 and 15 provides advantages over prior devices to assure that data in the drive memory is not lost or corrupted.

The Office Action recites that "it is well known in the art to use a process controller coupled to the detector and configured to receive an outputted level detected signal and output a process command to reexecute a write command in drive memory" without any basis or support therefor. Applicants respectfully request that the Office provide evidence that the particular recited subject matter is well known in the art or withdraw the rejection of claims 7 and 15. Reconsideration and allowance of claims 7 and 15 are respectfully requested.

Claims 8, 10, 11, 14 and 18 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Perry as applied to claims 1 and 12 above and further in view of Lee, U.S. Patent No. 4,868,447 and Morris, U.S. Patent No. 6,101,058. Morris issued on August 8, 2000 subsequent to Applicants' filing date and thus is prior art under 35 U.S.C. § 102(e). Morris is assigned to Seagate Technology, Inc., which is the same Assignee as the present application.

The combination of Perry, Morris and Lee do not teach nor suggest the subject matter recited in claims 8, 10, 11, 14 and 18. The present invention includes a transducer coupled to a movable suspension assembly coupled to an actuator and movable thereby for head positioning which provides advantages over prior

devices. In particular, the transducer can be configured for activation for head positioning. Claim 8 is dependent upon claim 1 and further recites a microactuator controller coupled to the transducer on the movable head suspension assembly configured to transmit a signal to the transducer to move the head.

Claims 10, 11 and 18 recite *inter alia* a transducer configured to operate between an detection mode and an actuator mode to position the head. Claim 14 is dependent upon claim 12 and recites *inter alia* transmitting a signal to the transducer on the suspension assembly to move the head. Perry teaches a transducer on a yoke supporting a plurality of heads and does not teach or suggest a transducer on a movable head suspension assembly coupled to an actuator for head positioning. There is no teaching or suggestion based upon the combination of Lee and Morris to activate the transducer 12 of Perry on yoke 15 to position the head since yoke supports a plurality of heads and is not actuated for head positioning. There is no suggestion or teaching in the cited references or otherwise to modify Perry to provide transducer activated position control on the yoke of Perry for head positioning. Thus, there is no teaching or suggestion in the cited references of the subject matter recited in claims 8, 10 and 14.

Claim 11 was rejected on the basis that the teachings of claim 8 meet the limitations of the claim. It is improper to reject claim 11 on the basis that Applicants' claim 8 teaches the subject matter of Applicants' claim 11. Claim 18 was rejected on the basis that the teachings of Applicants' claims 8, 10 and 14 meet the limitations of Applicants' claim 8. Similarly, it is improper to reject Applicants' claims on the teachings of its own claims. Based upon the foregoing reconsideration and withdrawal of the rejection to the claims are respectfully requested.

The Director is authorized to charge any fee deficiency required by this paper or credit any overpayment to Deposit Account No. 23-1123.

Respectfully submitted,

WESTMAN, CHAMPLIN & KELLY, P.A.

By: Deirdre Kvale

Deirdre Megley Kvale, Reg. No. 35,612
Suite 1600 - International Centre
900 Second Avenue South
Minneapolis, Minnesota 55402-3319
Phone: (612) 334-3222 Fax: (612) 334-3312

DMK:tas

MARKED-UP VERSION OF REPLACEMENT PARAGRAPHS

Surfaces of the discs include asperities and other defects due to variations in the manufacturing process or created during shipping and handling or operation and use of the disc drive. During read write operations a head may contact asperities on the disc surface interfering with read/write operations. Contact between the head and disc surface can damage the disc surface and result in permanent data loss for a write command. Prior disc drives incorporate acoustic emission sensors attached to an E-block arm to determine head-disc contact. A ~~S~~sensor attached to an E-block arm sense head -disc contact for some head on the E-block however its difficult to distinguish which head-disc interface is contacting. The present invention addresses these and other problems, and offers other advantages over prior art.

In the embodiment illustrated in FIG. 3, head vibration is detected by transducer 102 supported on a head suspension assembly and detector 104. Opposed terminals 106, 108 of the transducer 102 are oriented so that vibration or movement of the transducer along ~~the~~a detection axis ~~110~~ induces a transducer signal or voltage signal across terminals 106, 108. The transducer 102 can be oriented for detecting various vibration modes of the head or air bearing.

As shown in FIG. 3, detector 104 receives a transducer signal and outputs a level detected signal indicative of head vibration as illustrated by block 112 as will be explained. In the embodiment illustrated in FIG. 3, detector 104 includes a filter 116, an amplifier 118 and level detector 120. The transducer signal is filtered to pass vibration mode frequencies for detecting at least one vibration mode. In one embodiment, filter 116 passes vibration mode frequencies for at least one of

torsion or bending mode vibration. The signal is amplified by amplifier 118 and is passed through level detector 120 to output the level detected signal indicative of the vibration mode of the head. In particular, as shown in FIG. 4, the level detector 120 passes a threshold signal amplitude 122 for transducer signal 124 to output a level detected signal indicative of head vibration.

The head vibration detector can be used for testing head disc contact for design analysis or for drive diagnostics. For example, detector can be used for mapping drive asperities, bad disc sectors or analyzing handing damage. Thus the level detector 120 detects a threshold signal amplitude measuring head disc contact. Alternatively, the head vibration detector can be used for measuring take-off velocity (TOV) for design analysis as illustrated in FIG. 5. As shown, prior to "take-off" the level detected signal amplitude 126 is large indicative of the vibrational motion of the slider and air bearing and at "take-off" signal amplitude 128 is reduced.

L

MARKED-UP VERSION OF REPLACEMENT CLAIMS

1. (Amended) A disc drive comprising:

a disc rotationally coupled to a chassis;

a movable head suspension assembly coupled to an actuator and moveable thereby having ~~supporting~~ a head coupled thereto to read or write to a surface of the disc;

a transducer supported on the movable head suspension assembly to induce a transducer signal in response to head vibration; and

a detector receiving the transducer signal and outputting a level detected signal indicative of the head vibration.

4. (Amended) The disc drive of claim 3 wherein the frequency filter is configured to ~~pass~~ detect at least one of a bending mode or torsion mode frequency.

7. (Amended) The disc drive of claim 1 and further comprising:
a process controller coupled to the detector and configured to receive ~~an~~the outputted level detected signal and output a process command to reexecute ~~the~~a write command in drive memory.

8. (Amended) The disc drive of claim 1 and further comprising:

a microactuator controller coupled to the transducer on the movable head suspension assembly and configured to transmit a signal to the transducer to move the head.

9. (Amended) The disc drive of claim 1 wherein the disc drive

includes a plurality of discs rotationally coupled to the chassis and a plurality of movable head suspension assemblies having a head coupled thereto to read or write to surfaces of the plurality of discs and including a transducer coupled to each of the plurality of movable head suspension ~~assembly~~ assemblies.

10. (Amended) The disc drive assembly of claim 1 wherein the transducer is configured to operate between a detection mode and an actuation mode, in the detection mode, the transducer detecting head vibration and in the actuation mode the transducer moving the head.

11. (Amended) The disc drive assembly of claim ~~12~~10 including:

a microactuator controller coupled to the transducer and configured to operate the transducer in the actuation mode.

12. (Amended) A method for operating a disc drive comprising steps of:

(a) providing a transducer supported on a movable head suspension assembly having a head coupled thereto configured to generate a transducer signal indicative of head vibration;

(b) moving the movable head suspension assembly to position the head for read write operations; and

(~~b~~c) detecting the transducer signal and outputting a level detected signal indicative of head vibration.

14. (Amended) The method of claim 12 and further comprising the step of:

(~~c~~d) transmitting a signal to the transducer on the movable suspension assembly to move the head.

15. (Amended) The method of claim 12 and further comprising the steps~~s~~ of:

(~~e~~d) transmitting a command to rewrite a write command in drive memory in response to ~~a~~the level detected signal indicative of head vibration.

16. (Amended) The method of claim 12 and comprising the step of ~~(~~(~~e~~d) filtering the transducer signal ~~for~~to detect vibration frequencies of the head.

17. (Amended) The method of claim 12 wherein the disc drive includes a plurality of head suspension assemblies and further comprising:

(~~e~~d) individually detecting vibration for each of the plurality of head suspension assemblies.

18. The method of claim 12 including a microactuator controller coupled to the transducer and configured to transmit a signal to the transducer to move the head and comprising the step of:

(~~e~~d) selectively operating the disc drive in a detection mode and an actuation mode, in the detection mode the transducer detecting head vibration and in the actuation mode, the transducer moving the head.

19. (Amended) A drive assembly comprising:

a movable head suspension assembly supporting a head; and

means on the movable head suspension assembly for detecting head vibration.